

SmartLabs, Inc.

TEST REPORT FOR

**Insteon Motion Sensor II
Model: 2844-222**

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.249

Report No.: 96897-9

Date of issue: February 18, 2016



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

SmartLabs, Inc.
16542 Millikan Ave.
Irvine, CA 92606

REPORT PREPARED BY:

Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

REPRESENTATIVE: John Lockyer
Customer Reference Number: 16-3JL00116-01

Project Number: 96897

DATE OF EQUIPMENT RECEIPT:

February 1, 2016

DATE(S) OF TESTING:

February 1-3, 2016

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.00

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Fremont	US0082	SL2-IN-E-1148R	3082B-1	958979	A-0149

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.249

Test Procedure	Description	Modifications	Results
15.215(c)	Occupied Bandwidth	NA	Pass
15.249(a)	Field Strength of Fundamental	NA	Pass
15.249(a)	Field Strength of Spurious Emissions	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Insteon Motion Sensor II	SmartLabs, Inc.	2844-222	Sample 9

Support Equipment:

Device	Manufacturer	Model #	S/N
AC/DC power adapter	Apple	A1265	1X9423JG98QZ

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Modulation Type(s):	FSK 8kbps
Maximum Duty Cycle:	Greater than 98%
Antenna Type(s) and Gain:	-0.5dBi
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.3 VDC from battery or from USB Cable from a power adapter
Firmware / Software used for Test:	TxAlways p41.HEX for 915MHz

FCC Part 15 Subpart C

15.215(c) Occupied Bandwidth (20dB BW)

Test Setup/Conditions

Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2013)	Test Date(s):	2/1/2016
Configuration:	1		

Environmental Conditions

Temperature (°C)	19.9	Relative Humidity (%):	43
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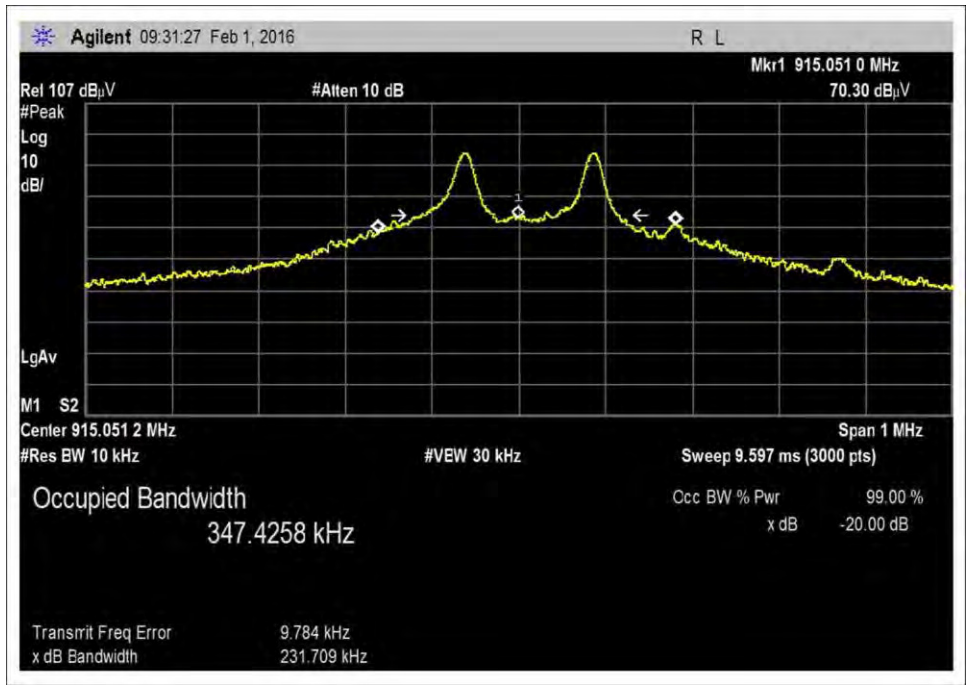
Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
00852	Biconilog Antenna	Schaffner	CBL 6111C	11/24/2014	11/24/2016
P00880	Cable	Pasternack	RG214U	6/13/2014	6/13/2016
P01187	Cable	Andrews	CNT-195	12/30/2014	12/30/2016
P06691	Cable	Pasternack	PE3062-180	8/8/2014	8/8/2016
00567	Preamp	HP	8447D	1/2/2015	1/2/2017
03471	Spectrum Analyzer	Agilent	E4440A	1/4/2016	1/4/2018

Test Data Summary

Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (MHz)	Results
915	1	FSK 8kbps	231.709	26	PASS

Plot



X Axis

Test Setup Photos



15.249(a) Field Strength of Fundamental

See data sheets for test setup and test equipment.

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	V _{Minimum} (dBuV/m)	V _{Nominal} (dBuV/m)	V _{Maximum} (dBuV/m)	Max Deviation from V _{Nominal} (dB)
915	FSK with 200kHz bandwidth at 8kbps/ Integral antenna	91.4	91.5	91.8	0.3

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage V_{nominal} ± 15%.

Parameter	Value
V _{Nominal} :	5VDC
V _{Minimum} :	4.25VDC
V _{Maximum} :	5.75VDC

Test Data Summary – Radiated Field Strength Measurement					
Frequency (MHz)	Modulation	Ant. Type	Measured (dBuV/m @ 3m)	Limit (dBuV/m @ 3m)	Results
915 at Horizontal X axis	FSK 8kbps	Integral	91.5	≤94	Pass
915 at Vertical X axis	FSK 8kbps	Integral	90.4	≤94	Pass
915 at Horizontal Y axis	FSK 8kbps	Integral	91.0	≤94	Pass
915 at Vertical X axis	FSK 8kbps	Integral	86.6	≤94	Pass

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 16:40:04
 Tested By: Hieu Song Nguyenpham Sequence#: 2
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

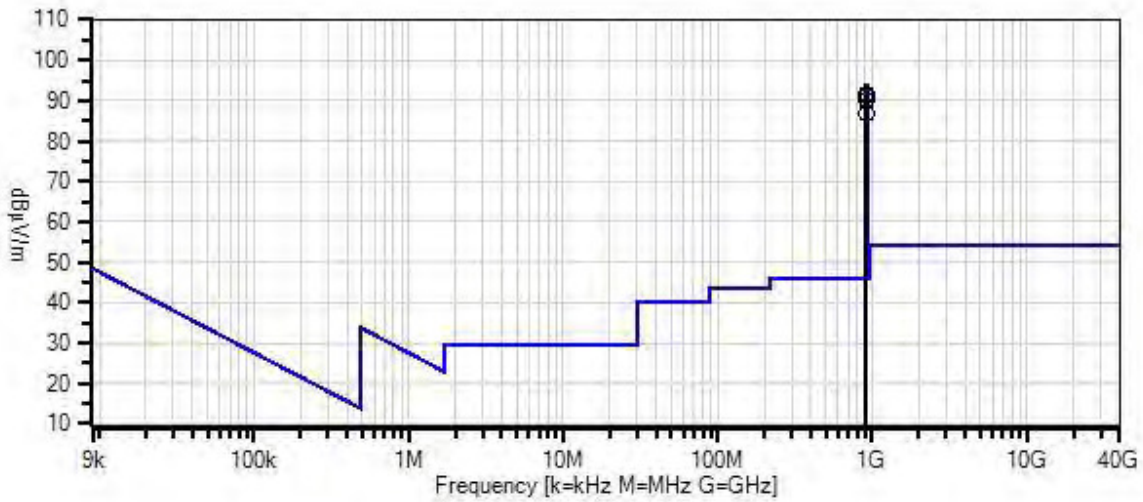
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Fundamental
 Firmware Used: TxAlways p41.HEX for 915MHz
 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 RBW=680kHz
 VBW=3MHz
 Method: ANSI C 63.10 2013
 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.

SmartLabs, Inc WD#: 96897 Sequence#: 2 Date: 2/1/2016
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Vert



- Readings
 - Peak Readings
 - × QP Readings
 - * Average Readings
 - ▼ Ambient
- Software Version: 5.03.00
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018

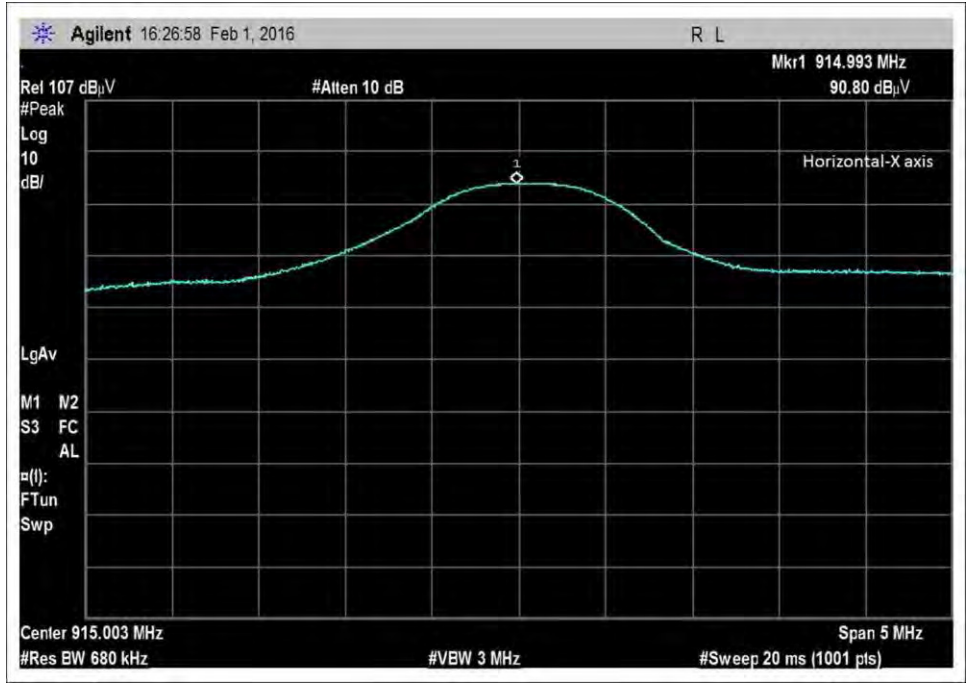
Measurement Data:

Reading listed by margin.

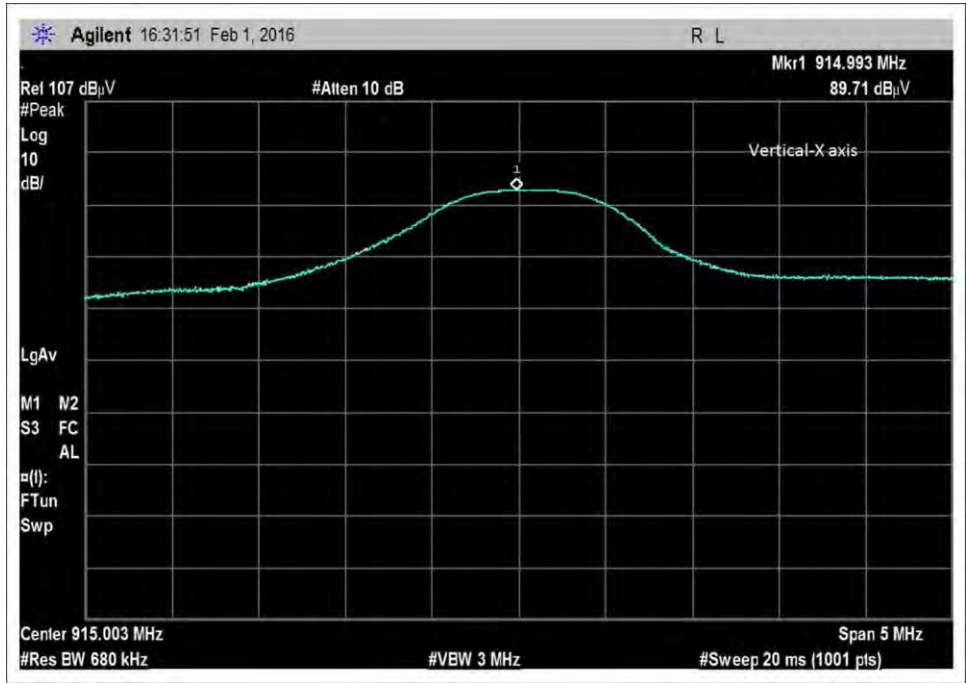
Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	914.993M	90.8	-28.0 +1.4	+23.4	+3.2	+0.7	+0.0	91.5	94.0 X axis	-2.5	Horiz
2	914.993M	90.3	-28.0 +1.4	+23.4	+3.2	+0.7	+0.0	91.0	94.0 Y axis	-3.0	Horiz
3	914.993M	89.7	-28.0 +1.4	+23.4	+3.2	+0.7	+0.0	90.4	94.0 X axis	-3.6	Vert
4	914.993M	85.9	-28.0 +1.4	+23.4	+3.2	+0.7	+0.0	86.6	94.0 Y-axis	-7.4	Vert

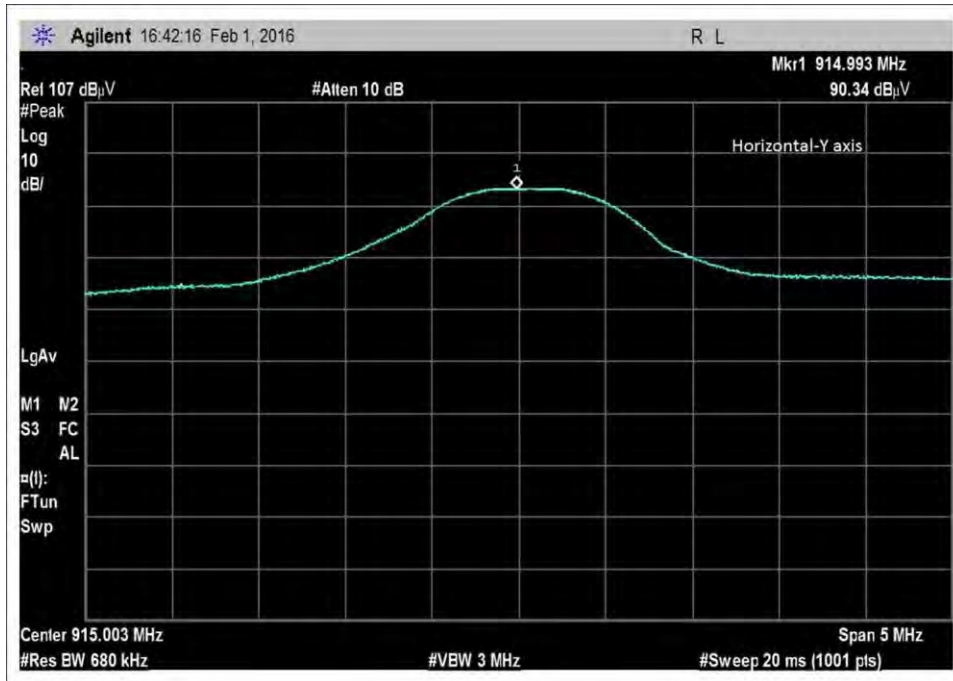
Plots



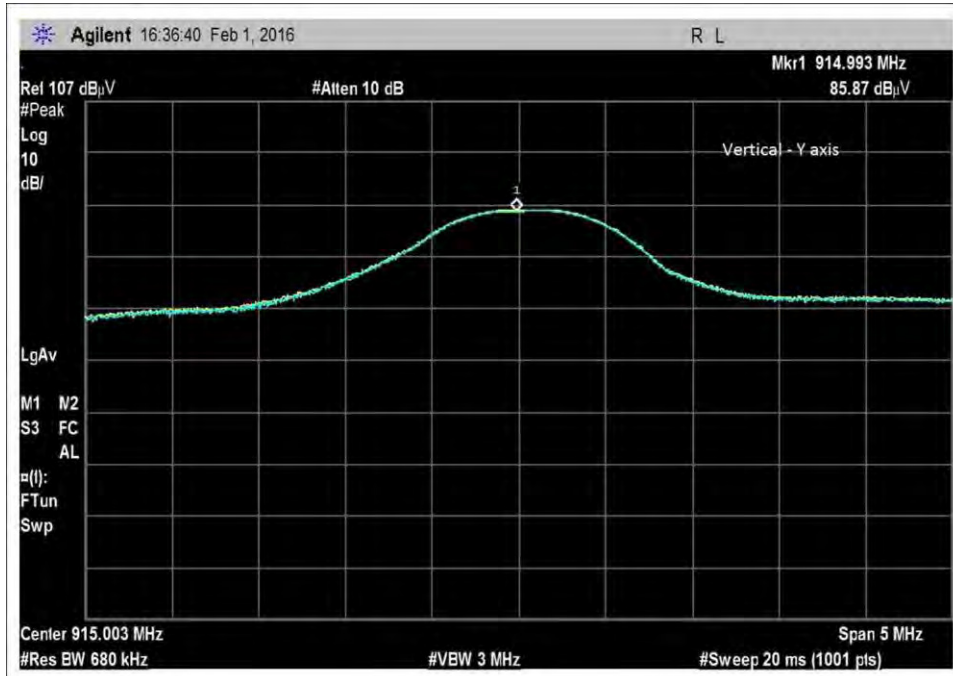
Horizontal, X axis



Vertical, X Axis

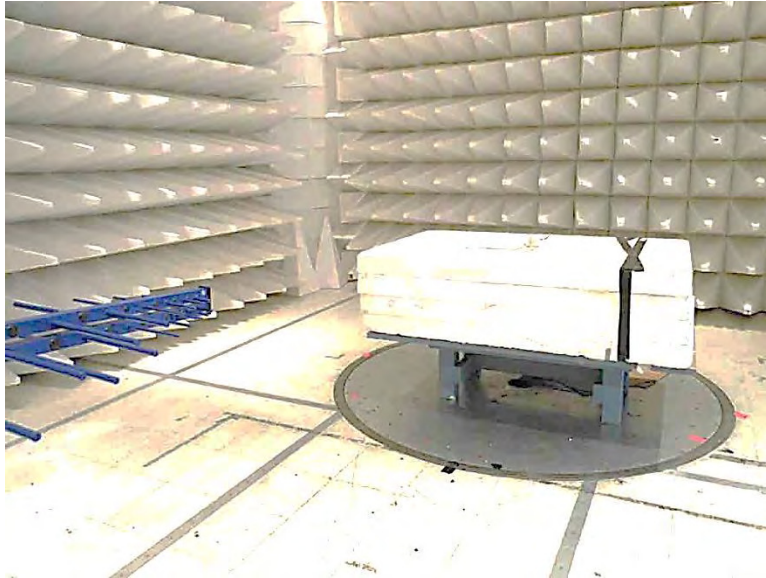


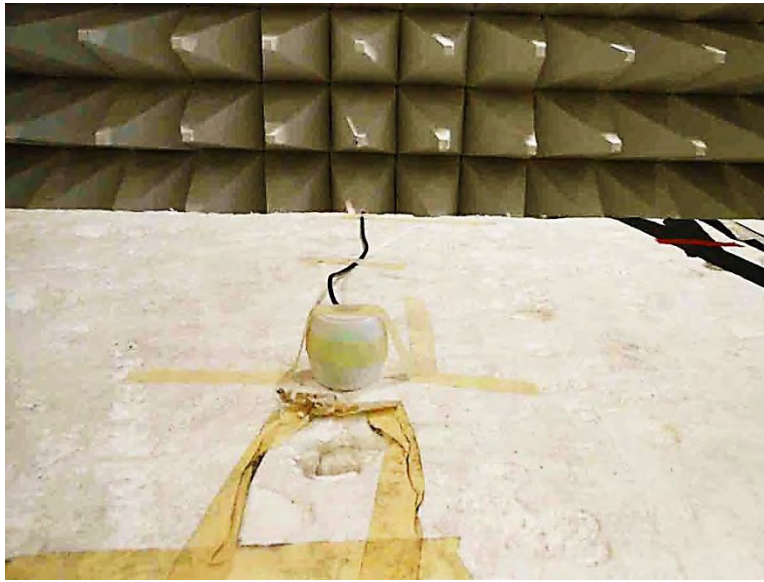
Horizontal, Y Axis



Vertical, Y Axis

Test Setup Photos





X Axis



Y Axis

15.249(a) Radiated Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 15:22:11
 Tested By: Hieu Song Nguyenpham Sequence#: 20
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Spurious Emission
 Frequency Range: 9kHz to 1000MHz

 Firmware Used: TxAlways p41.HEX for 915MHz.

 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa

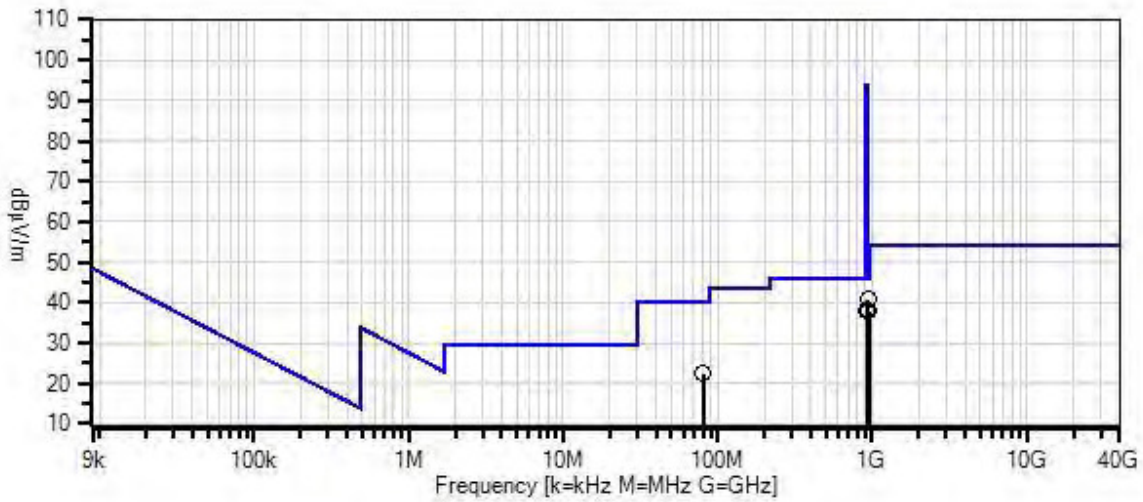
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel=1

 9 kHz -150 kHz;RBW=200 Hz,VBW=200 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,
 1000 MHz-10000MHz;RBW=1 MHz,VBW=1 MHz.

 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.

TX Mode
X-axis

SmartLabs, Inc W/O#: 96897 Sequence#: 20 Date: 2/1/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
	AN00432	Loop Antenna	6502	5/8/2015	5/8/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V/m	dB μ V/m	dB	Ant
			dB	dB	dB	dB					
1	934.987M	39.6	-27.9 +1.4	+23.7	+3.2	+0.7	+0.0	40.7	46.0	-5.3	Vert
2	944.965M	36.6	-27.9 +1.4	+23.8	+3.3	+0.7	+0.0	37.9	46.0	-8.1	Horiz
3	928.020M	36.8	-27.9 +1.4	+23.6	+3.2	+0.7	+0.0	37.8	46.0	-8.2	Vert
4	79.978M	41.6	-27.9 +0.3	+7.5	+0.8	+0.2	+0.0	22.5	40.0	-17.5	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 10:44:00
 Tested By: Hieu Song Nguyenpham Sequence#: 5
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Spurious Emission
 Frequency Range: 1000MHz to 10000MHz

Firmware Used: TxAlways p41.HEX for 915MHz.

Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa

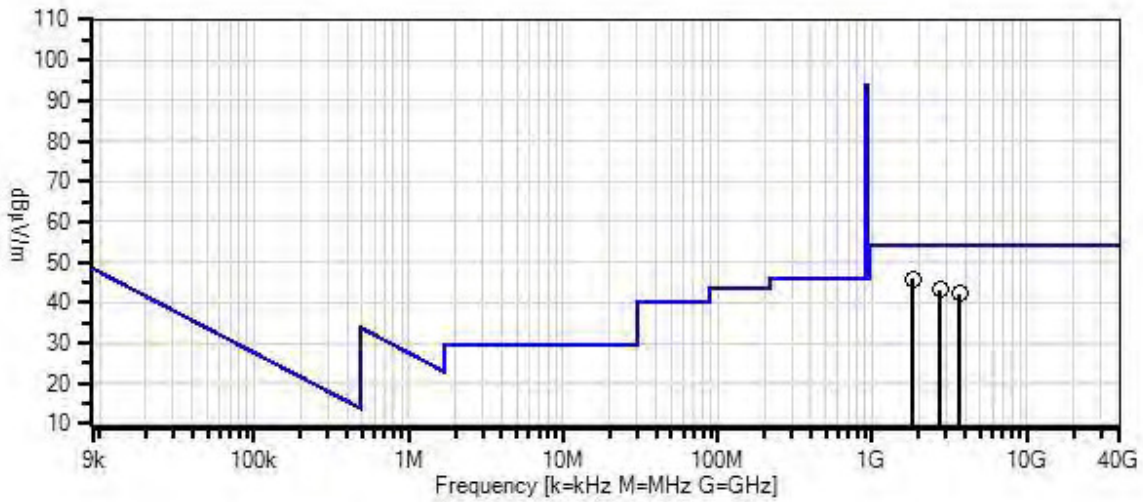
High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel =1

9 kHz -150 kHz;RBW=200 Hz,VBW=200 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,
 1000 MHz-10000MHz;RBW=1 MHz,VBW=1 MHz.

The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.

TX Mode
X-axis

SmartLabs, Inc W/O#: 96897 Sequence#: 5 Date: 2/1/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.00
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/22/2015	4/22/2017
T2	AN02113	Horn Antenna	3115	2/3/2015	2/3/2017
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T4	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T5	ANP06900	Cable	32022-29094K-29094K-36TC	12/30/2015	12/30/2017
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN03172	High Pass Filter	HM1155-11SS	1/18/2016	1/18/2018

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	Reading listed by margin.		T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			T1 dB	T2 dB							
1	1830.315M	75.9	-58.2 +0.5	+23.9 +0.6	+1.0	+2.2	+0.0	45.9	54.0	-8.1	Vert
2	2744.743M	69.7	-58.5 +0.6	+27.4 +0.1	+1.2	+2.7	+0.0	43.2	54.0	-10.8	Vert
3	3659.657M	66.2	-58.8 +0.6	+29.5 +0.2	+1.4	+3.2	+0.0	42.3	54.0	-11.7	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 •(510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 15:58:42
 Tested By: Hieu Song Nguyenpham Sequence#: 23
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Spurious Emission
 Frequency Range: 9kHz to 1000MHz

 Firmware Used: TxAlways p41.HEX for 915MHz.

 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa

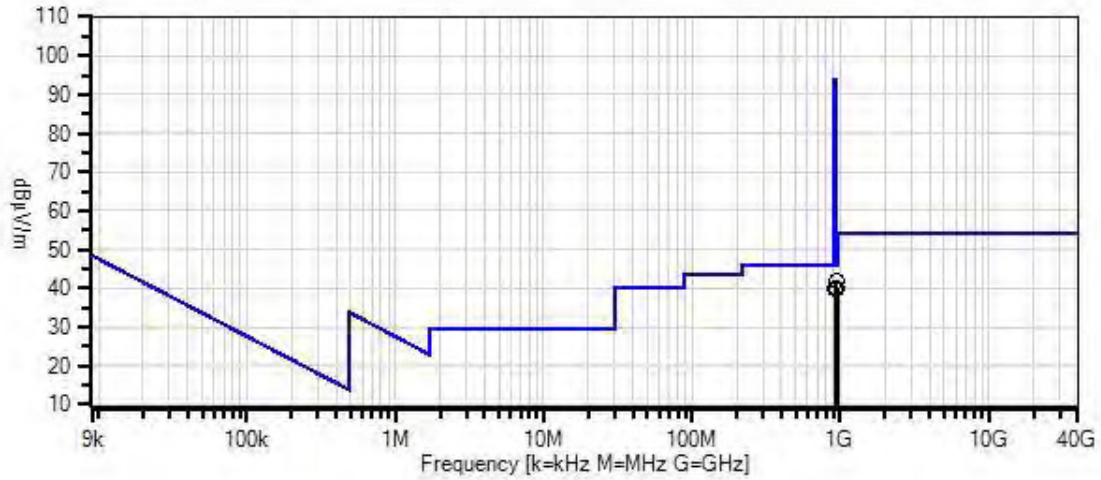
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel =1

 9 kHz -150 kHz;RBW=200 Hz,VBW=200 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,
 1000 MHz-10000MHz RBW=1 MHz,VBW=1 MHz.

 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.

TX Mode
Y-axis

SmartLabs, Inc W/O#: 96897 Sequence#: 23 Date: 2/1/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters



- Readings
 - Peak Readings
 - × QP Readings
 - * Average Readings
 - ▼ Ambient
- Software Version: 5.03.00
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
	AN00432	Loop Antenna	6502	5/8/2015	5/8/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5 dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	934.987M	40.8	-27.9 +1.4	+23.7	+3.2	+0.7	+0.0	41.9	46.0	-4.1	Vert
2	944.965M	38.8	-27.9 +1.4	+23.8	+3.3	+0.7	+0.0	40.1	46.0	-5.9	Vert
3	929.461M	39.1	-27.9 +1.4	+23.6	+3.2	+0.7	+0.0	40.1	46.0	-5.9	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 11:22:23
 Tested By: Hieu Song Nguyenpham Sequence#: 8
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

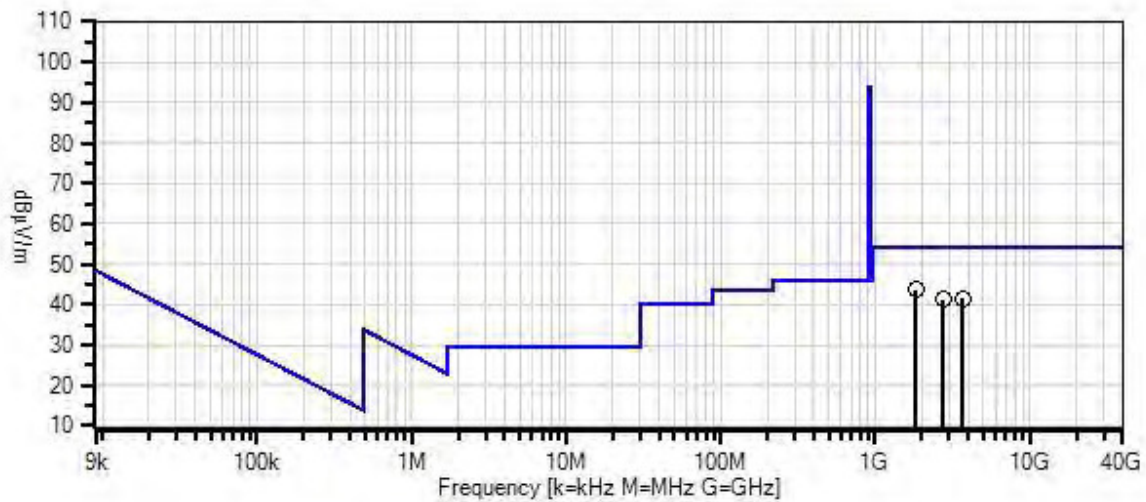
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Spurious Emission
 Frequency Range: 1000MHz to 10000MHz
 Firmware Used: TxAlways p41.HEX for 915MHz.
 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel=1
 9 kHz -150 kHz;RBW=200 Hz,VBW=200 Hz;
 150 kHz-30 MHz;RBW=9 kHz,VBW=9 kHz;
 30 MHz-1000 MHz;RBW=120 kHz,VBW=120 kHz,
 1000 MHz-10000MHz;RBW=1 MHz,VBW=1 MHz.
 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.
TX Mode
Y-axis

SmartLabs, Inc W/O#: 96897 Sequence#: 8 Date: 2/1/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.00
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/22/2015	4/22/2017
T2	AN02113	Horn Antenna	3115	2/3/2015	2/3/2017
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T4	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T5	ANP06900	Cable	32022-29094K-29094K-36TC	12/30/2015	12/30/2017
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
T6	AN03172	High Pass Filter	HM1155-11SS	1/18/2016	1/18/2018

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	Reading listed by margin.		T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			T1 dB	T2 dB							
1	1830.260M	73.7	-58.2 +0.5	+23.9 +0.6	+1.0	+2.2	+0.0	43.7	54.0	-10.3	Horiz
2	3660.658M	65.4	-58.8 +0.6	+29.5 +0.2	+1.4	+3.2	+0.0	41.5	54.0	-12.5	Horiz
3	2744.915M	67.7	-58.5 +0.6	+27.4 +0.1	+1.2	+2.7	+0.0	41.2	54.0	-12.8	Horiz

Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
915	FSK 8kbps	Integral	91.5	<46	Pass

Test performed using operational mode with the highest output power, representing worst case

Band Edge Setup/ Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**
 Work Order #: **96897** Date: 2/1/2016
 Test Type: **Radiated Scan** Time: 16:40:04
 Tested By: Hieu Song Nguyenpham Sequence#: 2
 Software: EMITest 5.03.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

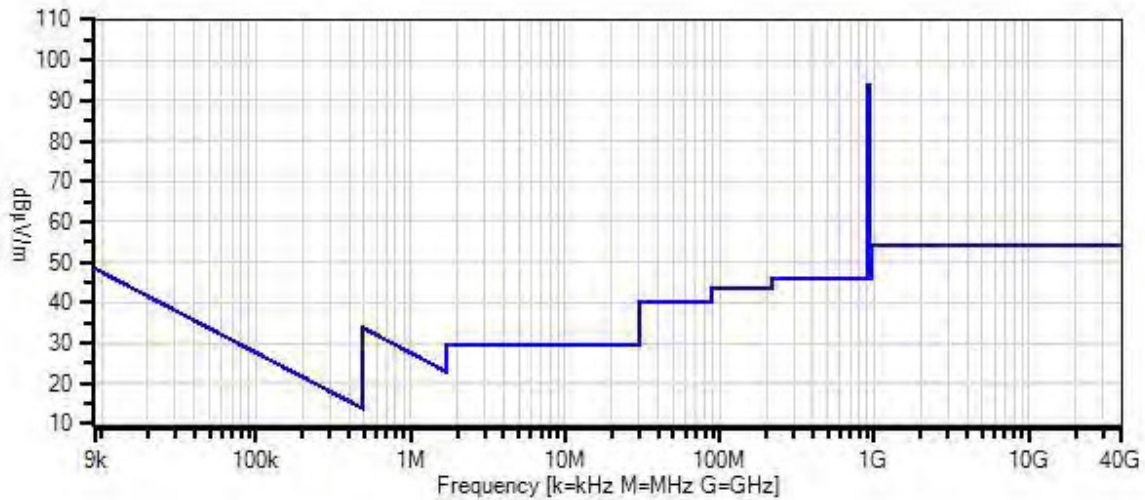
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Band Edge
 Firmware Used: TxAlways p41.HEX for 915MHz
 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table and at the center of a turning table.
 The EUT is set in continuously transmitting or receiving as intended.

SmartLabs, Inc W/O#: 96897 Sequence#: 2 Date: 2/1/2016
 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Horiz

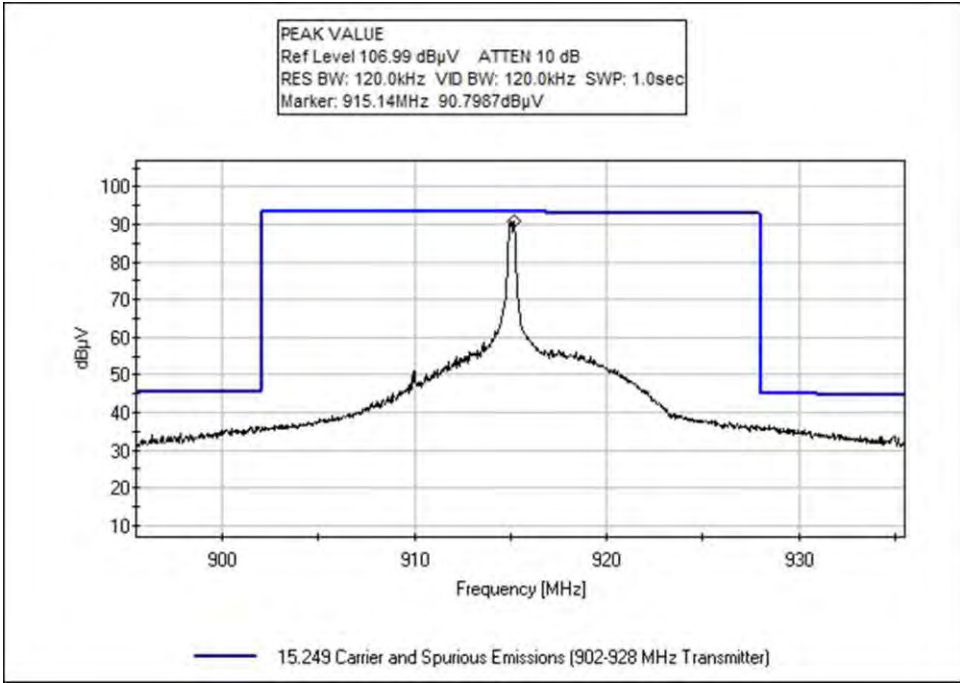


- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.00
- 1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

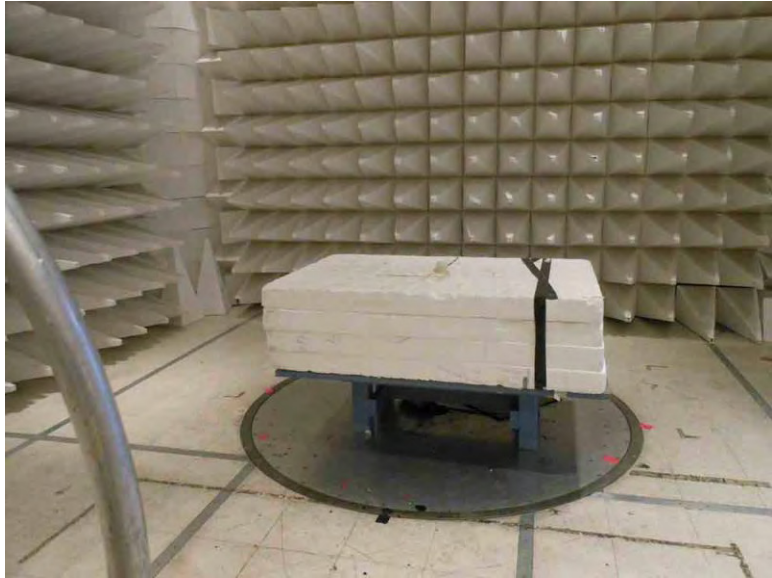
Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN00567	Preamp	8447D	1/2/2015	1/2/2017
	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018

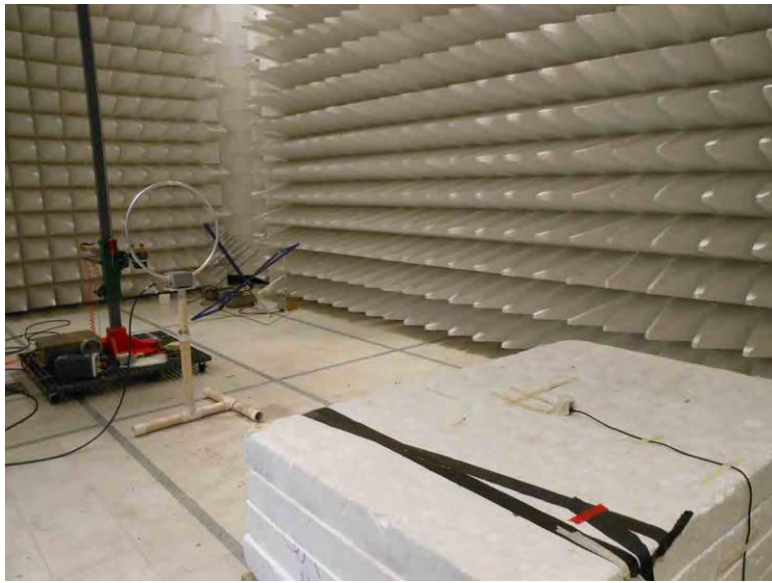
Band Edge Plot



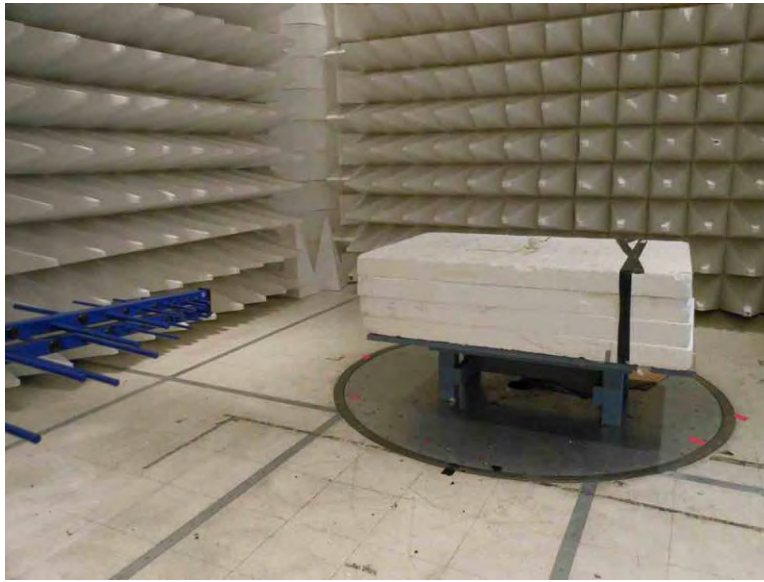
Test Setup Photos



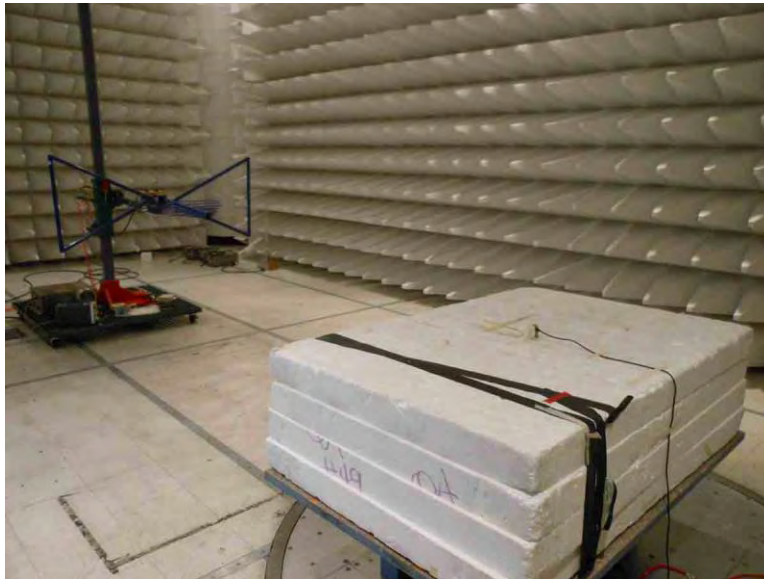
9kHz – 30MHz



9kHz – 30MHz



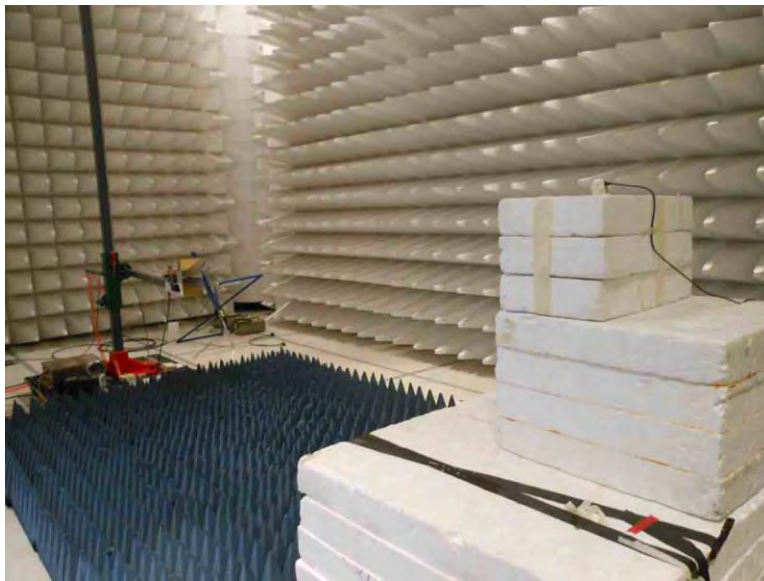
30MHz – 1GHz



30MHz – 1GHz



1 – 10GHz



1 – 10GHz



X Axis



Y Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **SmartLabs, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **96897** Date: 2/3/2016
 Test Type: **Conducted Emissions** Time: 08:49:41
 Tested By: Hieu Song Nguyenpham Sequence#: 24
 Software: EMITest 5.03.00 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Conducted Emission
 Frequency Range: 150kHz to 30MHz

 Firmware Used: TxAlways p41.HEX for 915MHz.

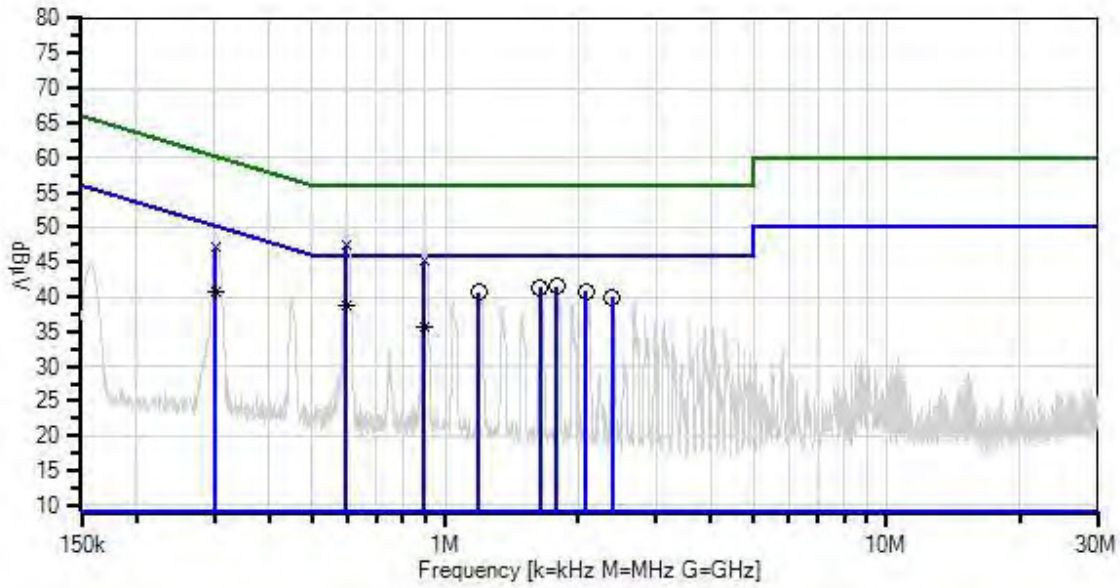
 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa

 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel=1

 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter. It is placed on a Styrofoam table. The EUT is set in continuously transmitting or receiving as intended.

TX Mode

SmartLabs, Inc WO#: 96897 Sequence#: 24 Date: 2/3/2016
 15.207 AC Mains - Average Test Lead: 120V 60Hz



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	3/31/2015	3/31/2017
T2	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T3	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
T4	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
T5	ANP05258	High Pass Filter	HE9615-150K- 50-720B	11/14/2014	11/14/2016

Measurement Data:

Reading listed by margin.

Test Lead: Line

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	1.787M	31.3	+9.8 +0.2	+0.1	+0.0	+0.1	+0.0	41.5	46.0	-4.5	Line
2	1.643M	31.1	+9.8 +0.2	+0.1	+0.0	+0.1	+0.0	41.3	46.0	-4.7	Line
3	2.085M	30.5	+9.9 +0.2	+0.1	+0.0	+0.1	+0.0	40.8	46.0	-5.2	Line
4	1.192M	30.5	+9.8 +0.2	+0.1	+0.0	+0.1	+0.0	40.7	46.0	-5.3	Line
5	2.387M	29.8	+9.8 +0.2	+0.1	+0.0	+0.1	+0.0	40.0	46.0	-6.0	Line
6	595.497k Ave	28.7	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	38.8	46.0	-7.2	Line
7	595.497k QP	37.3	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	47.4	56.0	-8.6	Line
^	595.497k	39.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	49.6	46.0	+3.6	Line
9	301.279k Ave	30.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	40.6	50.2	-9.6	Line
10	894.856k Ave	25.6	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	35.8	46.0	-10.2	Line
11	894.856k QP	35.0	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	45.2	56.0	-10.8	Line
^	894.856k	36.7	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	46.9	46.0	+0.9	Line
13	301.279k QP	37.0	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	47.1	60.2	-13.1	Line
^	301.279k	38.6	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	48.7	50.2	-1.5	Line

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 •
 Customer: **SmartLabs, Inc.**
 Specification: **15.207 AC Mains - Average**
 Work Order #: **96897** Date: 2/3/2016
 Test Type: **Conducted Emissions** Time: 09:00:44
 Tested By: Hieu Song Nguyenpham Sequence#: 25
 Software: EMITest 5.03.00 120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

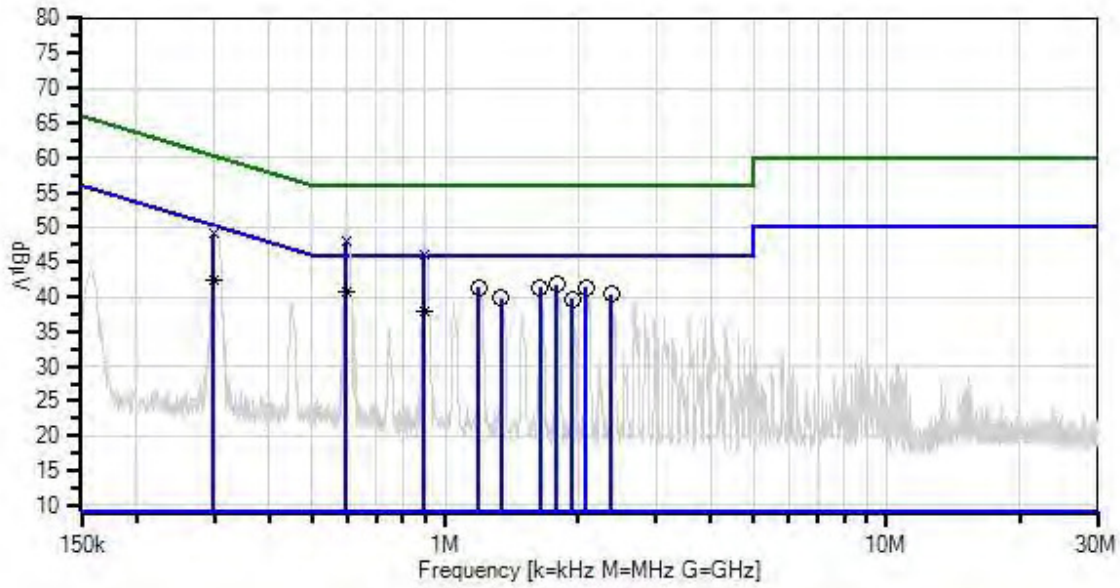
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Conducted Emission
 Frequency Range: 150kHz to 30MHz
 Firmware Used: TxAlways p41.HEX for 915MHz.
 Temperature: 19.9°C
 Humidity: 43 %
 Atmospheric Pressure: 101.8 kPa
 High Clock: 10MHz
 Transmitting operating frequency= 915MHz
 Method: ANSI C 63.10 2013
 Number of Channel=1
 The EUT is a wall mounted device and operated at 5VDC through a USB cable from a power adapter.
 It is placed on a Styrofoam table. The EUT is set in continuously transmitting or receiving as intended.

TX Mode

SmartLabs, Inc WO#: 96897 Sequence#: 25 Date: 2/3/2016
15.207 AC Mains - Average Test Lead: 120V 60Hz



— Sweep Data	— Readings	○ Peak Readings
x QP Readings	* Average Readings	▼ Ambient
Software Version: 5.03.00	— 1 - 15.207 AC Mains - Average	— 2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	3/31/2015	3/31/2017
T2	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T3	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN00493	50uH LISN-L1 (L) Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
T4	AN00493	50uH LISN-L(2) N Loss W/O European Adapter	3816/NM	3/4/2015	3/4/2017
	AN03471	RF Characteristics Analyzer	E4440A	1/4/2016	1/4/2018
T5	ANP05258	High Pass Filter	HE9615-150K- 50-720B	11/14/2014	11/14/2016

Measurement Data:

Reading listed by margin.

Test Lead: Neutral

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	dB	dB	dB	dB	Table	dB μ V	dB μ V	dB	Ant
1	1.792M	31.0	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	41.8	46.0	-4.2	Neutr
2	1.643M	30.6	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	41.4	46.0	-4.6	Neutr
3	1.192M	30.5	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	41.3	46.0	-4.7	Neutr
4	2.089M	30.4	+9.9 +0.2	+0.1	+0.0	+0.7	+0.0	41.3	46.0	-4.7	Neutr
5	596.996k Ave	30.0	+9.9 +0.1	+0.0	+0.0	+0.7	+0.0	40.7	46.0	-5.3	Neutr
6	2.383M	29.5	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	40.3	46.0	-5.7	Neutr
7	1.341M	29.0	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	39.8	46.0	-6.2	Neutr
8	1.936M	28.8	+9.8 +0.2	+0.1	+0.0	+0.7	+0.0	39.6	46.0	-6.4	Neutr
9	299.517k Ave	31.6	+9.9 +0.1	+0.0	+0.0	+0.7	+0.0	42.3	50.3	-8.0	Neutr

10	596.996k	37.2	+9.9	+0.0	+0.0	+0.7	+0.0	47.9	56.0	-8.1	Neutr
	QP		+0.1								
^	596.996k	39.0	+9.9	+0.0	+0.0	+0.7	+0.0	49.7	46.0	+3.7	Neutr
			+0.1								
12	895.316k	27.0	+9.9	+0.1	+0.0	+0.7	+0.0	37.8	46.0	-8.2	Neutr
	Ave		+0.1								
13	895.316k	35.3	+9.9	+0.1	+0.0	+0.7	+0.0	46.1	56.0	-9.9	Neutr
	QP		+0.1								
^	895.316k	36.9	+9.9	+0.1	+0.0	+0.7	+0.0	47.7	46.0	+1.7	Neutr
			+0.1								
15	299.517k	38.3	+9.9	+0.0	+0.0	+0.7	+0.0	49.0	60.3	-11.3	Neutr
	QP		+0.1								
^	299.517k	39.7	+9.9	+0.0	+0.0	+0.7	+0.0	50.4	50.3	+0.1	Neutr
			+0.1								

Test Setup Photos



SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on the limit value subtracting the corrected measured value; a negative margin represents a measurement less than the limit while a positive margin represents a measurement exceeding the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.